In the Claims

1. (Currently Amended) A method for peer-to-peer ranging and discovery of a rigid body existing in a scatternet having piconets and nodes, which comprises:

defining a node in a piconet to be a piconet controller having controller functions;

locating a rigid body seed including the node; ~~and~~

discovering a rigid body by sequentially downloading controller functions of the piconet controller to at least one border node; and

providing the nodes with an average network degree of at least 8.

2. (Original) The method according to claim 1, which further comprises randomly deploying nodes in each piconet of the scatternet at a constant density having an average network degree at least high enough to form the rigid body seed in each of the piconets.

3. (Cancelled).

4. (Original) The method according to claim 1, which further comprises:

providing the scatternet with a boundary defining a coverage area; and

arbitrarily selecting the node in the scatternet to be one hop away from the boundary.

5. (Original) The method according to claim 4, which further comprises broadcasting a command from the piconet controller to all nodes in the respective piconet of the piconet

controller to execute a range measurement with respect to the piconet controller and among all reachable peer member nodes.

6. (Original) The method according to claim 5, which further comprises:

assigning each node of the scatternet a unique identification;

executing range measurements by and among the nodes and the piconet controller in the respective piconet; and

reporting ranging information along with a respective node identification to the piconet controller and storing the ranging information and the respective identifications in the piconet controller.

7. (Original) The method according to claim 6, which further comprises carrying out the rigid body seed location step by:

determining with the piconet controller a smallest rigid body seed located within an area of the piconet dependent upon the ranging information obtained by the piconet controller; and

subsequently determining possible rigid bodies in the scatternet.

8. (Original) The method according to claim 7, which further comprises defining the area to have a radius equal to half of a communications range of the piconet controller.

9. (Original) The method according to claim 7, which further comprises, for each rigid body discovered:

determining if the rigid body is anchored by available reference nodes and:

if reference nodes anchor the rigid body, calculating an absolute location for each node of the anchored rigid body; and

if reference nodes do not anchor the rigid body, determining if the non-anchored rigid body can be partially anchored and:

if the non-anchored rigid body can be partially anchored, adjusting local coordinates for the partially anchored rigid body to reflect partial global coordinates; and

if the non-anchored rigid body cannot be partially anchored, setting up local coordinates for the non-anchored rigid body.

10. (Original) The method according to claim 9, which further comprises:

selecting, with the piconet controller, an arbitrary node on a boundary of a largest rigid body of the rigid bodies to be a slave piconet controller;

searching out, with the slave piconet controller, new node members of a piconet of the slave piconet controller and determining the number of new node members found by the slave piconet controller;

comparing the number of new node members found by the slave piconet controller with a value of an average network degree of the scatternet; and:

if a number of new node members found by the slave piconet controller is at least approximately one-third of the average network degree:

selecting the slave piconet controller as a new piconet controller to be handed over the controller functions;

handing over the controller functions from the piconet controller to the slave piconet controller; and

forming a new piconet with the new piconet controller including all new node members outside the range of the piconet controller and

within the range of the new piconet controller along with all other node members in the range of the new piconet controller; and

if the number of new node members found by the slave piconet controller is up to two:

permitting the slave piconet controller only to collect the ranging information from the new node members and among the new node members;

maintaining the controller functions with the piconet controller;

if another arbitrary node exists on the boundary of the largest rigid body to be a slave piconet controller, repeating the selecting, searching, determining, comparing, selecting, handing, forming, permitting, and maintaining steps; and

if another arbitrary node does not exist on the boundary of the largest rigid body to be a slave piconet controller and if no slave piconet controller selected by the piconet controller can find more than one-third of the average network degree of new node members:

selecting an already examined arbitrary node having a highest number of new node members as the new piconet controller to be handed over the controller functions;

handing over the controller functions from the piconet controller to the new piconet controller; and

forming a new piconet with the new piconet controller including all new members outside the range of the original piconet controller and within the range of the new piconet controller along with all other node members in the range of the new piconet controller.

11. (Original) The method according to claim 10, which further comprises repeating the selecting, searching, determining, comparing, selecting, handing, forming, permitting, maintaining, selecting, handing over, and forming steps for each rigid body.

12. (Original) The method according to claim 10, which further comprises carrying out the handing over step by downloading into a memory of the slave piconet controller at least the controller functions, the ranging information, and the identifications.

13. (Original) The method according to claim 10, which further comprises repeating the step of handing over the controller functions from the piconet controller to a new piconet controller until the entire coverage area of the scatternet is traversed.

14. (Original) The method according to claim 11, which further comprises repeating the step of handing over the controller functions from the piconet controller to a new piconet controller until the entire coverage area of the scatternet is traversed.

15. (Original) The method according to claim 10, which further comprises carrying out the handing over of the controller functions step by storing the ranging information, the identifications, topological information regarding the scatternet, and information regarding structure of at least one of the rigid bodies.

16. (Original) The method according to claim 10, which further comprises storing the ranging information, the identifications, topological information regarding the scatternet, and information regarding structure of at least one of the rigid bodies in the new piconet controller and in a piconet controller immediately preceding the new piconet controller one of:

before carrying out the handing over of the controller functions step;

while carrying out the handing over of the controller functions step; and

immediately after carrying out the handing over of the controller functions step.

17. (Original) The method according to claim 10, which further comprises providing fault tolerance by storing the ranging information, the identifications, topological information regarding the scatternet, and information regarding structure of at least one of the rigid bodies in the new piconet controller and in a piconet controller immediately preceding the new piconet controller one of:

before carrying out the handing over of the controller functions step;

while carrying out the handing over of the controller functions step; and

immediately after carrying out the handing over of the controller functions step.

18. (Original) In a scatternet of communications nodes defining piconets, a communications node, comprising:

a receiver for receiving communications from other communications nodes in a communications range;

a transmitter for sending communications to other communications nodes in said communications range;

a memory storing at least ranging information and a unique identification for describing the node; and

a processor connected to said receiver, to said transmitter, and to said memory, said processor being programmed to:

broadcast a command to all nodes in said communications range to execute range measurements with respect to said processor and among all nodes in said communications range;

execute range measurements with at least some of the nodes in said communications range and store said range measurements along with respective node identifications as at least a portion of the ranging information in said memory;

transmit the ranging information to another node in said communications range;

receive a handing over of piconet controller functions from another node and to hand over said piconet controller functions to another node;

carry out said piconet controller functions; and

carry out slave piconet controller functions.

19. (Original) The communications node according to claim 18, wherein said piconet controller functions include:

determining a smallest rigid body seed located within said communications range dependent upon at least some of the ranging information;

determining possible rigid bodies within said communications range;

for each rigid body discovered:

determining if the rigid body is anchored by available reference nodes and:

if reference nodes anchor the rigid body, calculating absolute locations for each node of the anchored rigid body and storing said absolute locations in said memory; and

if reference nodes do not anchor the rigid body, determining if the non-anchored rigid body can be partially anchored and:

if the non-anchored rigid body can be partially anchored, adjusting local coordinates for the partially anchored rigid body to reflect partial global coordinates and storing said adjusted local coordinates in said memory; and

if the non-anchored rigid body cannot be partially anchored, setting up local coordinates for the non-anchored rigid body and storing said local coordinates in said memory;

downloading into said memory at least said piconet controller functions, the ranging information, the identifications, topological information regarding the scatternet, and information regarding structure of at least one of the rigid bodies including said absolute locations and said local coordinates;

determining if an entire coverage area of the scatternet is traversed and terminating handover of said piconet controller functions when the entire coverage area of the scatternet is traversed; and

selecting an arbitrary node on a boundary of a largest rigid body of the rigid bodies to be a slave piconet controller.

20. (Original) The communications node according to claim 19, wherein said processor is programmed to carry out slave piconet controller functions including:

searching out, in said communications range, new node members of a piconet in which said processor is located;

determining a number of new node members found;

comparing the number of new node members found with a value of an average network degree of the scatternet; and:

if a number of new node members found is at least approximately one-third of the average network degree:

selecting the slave piconet controller having the number of new node members equal to at least approximately one-third of the average

network degree to be a piconet controller to which said piconet controller functions are to be handed over and handing over said piconet controller functions to the selected slave piconet controller; and

if the number of new node members found is up to two, only collecting the ranging information from the new node members and among the new node members;

if another arbitrary node does not exist on the boundary of the largest rigid body to be a slave piconet controller and if no slave piconet controller selected can find more than one-third of the average network degree of new node members, selecting an already examined arbitrary node having a highest number of new node members as a piconet controller to which said piconet controller functions are to be handed over and handing over said piconet controller functions to said already examined arbitrary node; and

forming an expanded piconet including all of the new node members found outside a range of the node from which said piconet controller functions were handed over and within said range along with all other node members in said range.

21. (Original) The communications node according to claim 18, wherein said memory holds the node identifications, said piconet controller functions, said slave piconet

controller functions, the ranging information, topological information regarding the scatternet, and information regarding structure of at least one of the rigid bodies including said absolute locations and said local coordinates.